

# Sometimes, there just isn't enough time in a day

By Kelly Humphries

When a shuttle mission is as jam-packed as STS-85 with experiments that need to be pointed at their targets, there just isn't enough time in the crew's day to get everything done. That's why flight controllers in the Mission Control Center are working together on the ground during this mission to routinely maneuver the shuttle during the crew's sleep shift using what are called Display Electronic Unit equivalents. More than 160 attitude maneuvers that control the position of the shuttle in relation to its orbit and the Earth will be executed during the 10-day flight to support observations by instruments associated with the Technology Applications and Science-1 and International Extreme Ultraviolet Hitchhiker-2, and to help track the location of the co-orbiting Cryogenic Infrared Spectrometers and Telescopes for the Atmosphere-Shuttle Pallet Satellite-2. Of

those, more than 137 "DEU equivalent" loads, as they are called, are being sent to the shuttle to execute 31 maneuvers by the Planning Shift in Mission Control. "The choice was to either do them when the crew was asleep, extend the flight, or make it a dual shift mission," said Keith Lawson, the lead STS-85 pointer for the Flight Activities Officer discipline, a United Space Alliance worker. "By being able to maneuver during the crew sleep period, we can accomplish all the inertial pointing requirements we have on the flight and still keep it as short as possible so it maximizes payload return." This is not the first flight on which such maneuvers have been unplinked by the ground, but it is the first time this magnitude of DEU equivalent maneuvers have been

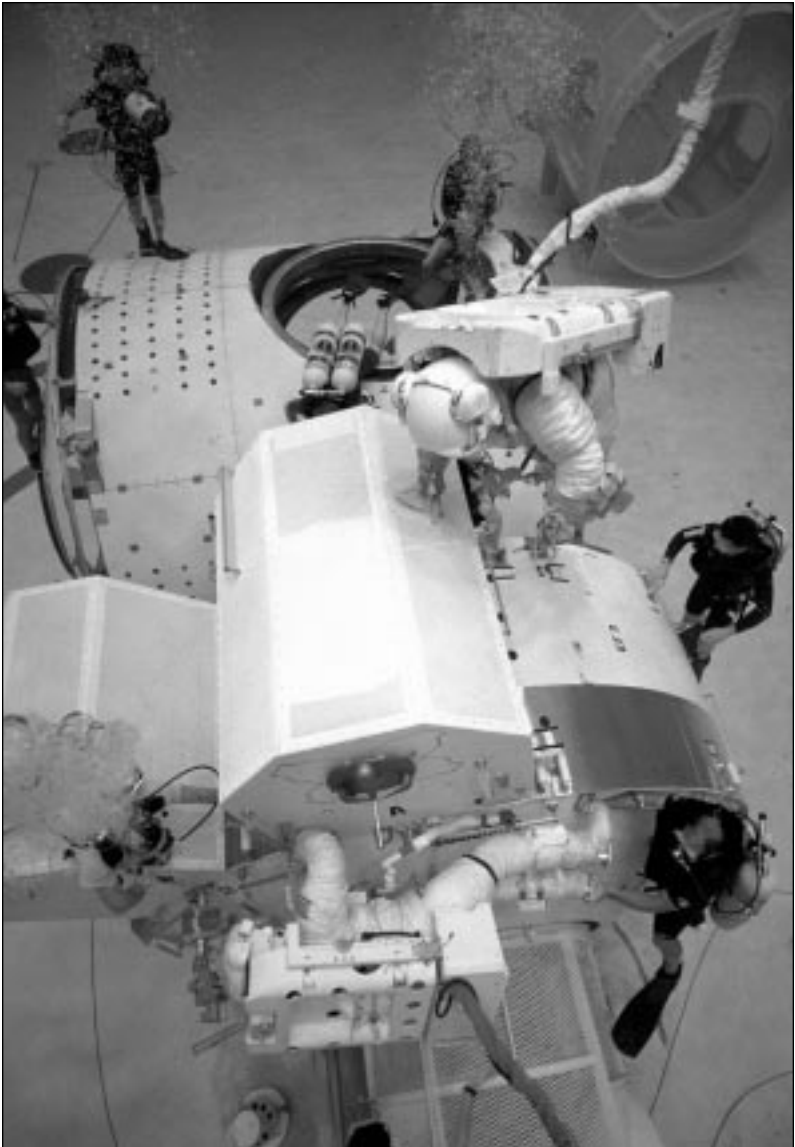
planned preflight as part of the normal mission. "We've actually done those pretty routinely in a contingency sense," said STS-85 Lead Flight Director Bryan Austin. "What we haven't done very much is a series of chained maneuvers, four and five and six maneuvers through a shift that will take the focus of a number of people and keep them in a real-time execution focus while at the same time their planning shift job is going on." When the flight control team uplinks the commands, it is in effect mimicking the process that a crew member on board would go through on its computer command keypad, said Terri Murphy, lead Data Processing Systems officer for STS-85. "I think it's going to be really challenging for

DPS," Murphy said before the flight. "It's going to keep us busy." The process starts with the Flight Activity Officer and the payload customers finding what blocks of the flight are going to be dedicated to each payload. FAO has to come up with block of time for each activity and then find specific targets and times to build an attitude timeline. FAO builds a prospective DEU command timeline which the Guidance, Navigation and Control Officer reviews for technical correctness. The Instrumentation and Communications Officer reviews it and inserts tones to wake up the crew if any maneuver move the shuttle out of a good communications attitude and has to get their attention. The DPS officer converts these scratch pad entries into command loads in the Mission Operations Computer. The command is reviewed again Please see **SLEEP**, Page 8



## Parker takes reins of JPL management

Robert Parker has been selected as the new director of the NASA Management Office at NASA's Jet Propulsion Laboratory. Currently director of Space Operations and Utilization in the Office of Space Flight at NASA Headquarters, Parker 60, is a former astronaut who flew aboard STS-35 in December 1990 and STS-9 in November 1983. He was selected as a NASA astronaut in 1967, serving as a member of the support crew for Apollo 15 and Apollo 17, and as the program scientist for the Skylab Program Director's Office. Subsequent to his flight career, Parker served in senior management positions in the Office of Space Flight. The director of the JPL NASA Management Office provides on-site oversight of the NASA contract with JPL, and leadership in negotiations of NASA contract requirements with JPL and the California Institute of Technology, the organization that operates JPL. The director also enables management and technical support for NASA field centers and Headquarters offices that have work performed at JPL. "Dr. Parker is a perfect fit for this post," said NASA's Associate Administrator for Space Science, Wesley Huntress. "His experience as a scientist and science manager is vital to interacting with JPL and Caltech, and his experience in the Office of Space Flight will help bring NASA's robotic and human space flight programs even closer together." Please see **PARKER**, Page 7



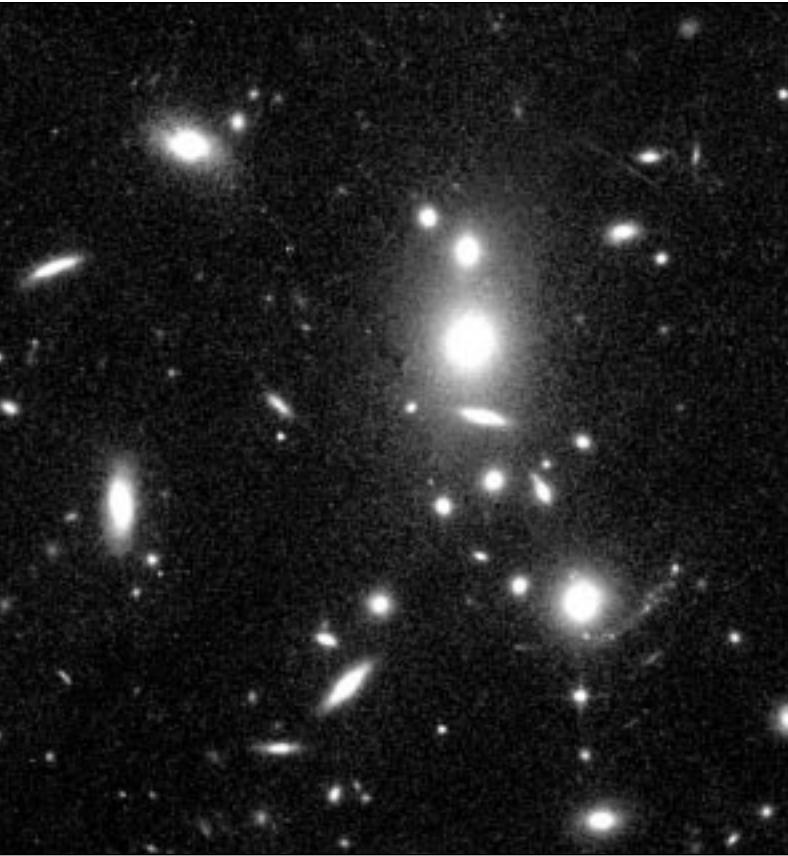
JSC Photo 97-09514 by Mark Sowa

**WATER WALK—Astronauts Mike Gernhardt and Claude Nicollier evaluate space walk tasks that will be performed in August 1999 to connect an airlock to the International Space Station. Astronaut James Reilly is slated to make the actual space walk with Gernhardt on the seventh assembly mission. The airlock will enable the station to support both U.S. and Russian space walks without a shuttle present.**

## Mars Pathfinder completes main mission goals

NASA's Mars Pathfinder spacecraft—a novel mission to send an inexpensive lander and roving prospector to the surface of Mars—has concluded its primary mission, fulfilling all of its objectives and returning a wealth of new information about the red planet. The robotic lander, which continues to explore an ancient outflow channel in Mars' northern hemisphere, completed its milestone 30-day mission on Aug. 3, capturing far more data on the atmosphere, weather and geology of Mars than scientists had expected. In all, Pathfinder has returned 1.2 gigabits (1.2 billion bits) of data and 9,669 tantalizing pictures of the Martian landscape to date. "The data returned by the Sagan Memorial Station and Sojourner has been nothing short of spectacular, and it will help provide a scientific basis for future Mars missions, including a sample return, for years to come," said Dr. Wesley Huntress, NASA associate administrator for space science. "The Pathfinder team's 'can do' attitude not only was critical to overcoming several complex technical challenges during development and cruise, but has carried through the uncharted territory of operating a solar powered lander and mobile rover on the surface of a planet millions of miles from Earth."

"This mission demonstrated a reliable and low-cost system for placing science payloads on the surface of Mars," said Brian Muirhead, Mars Pathfinder project manager at NASA's Jet Propulsion Laboratory. A new portrait of the Martian environment has begun to emerge in the 30 days since Pathfinder and its small, 23-pound rover began to record weather patterns, atmospheric opacity and the chemical composition of rocks washed down into the Ares Vallis flood plain. The rover's alpha proton X-ray spectrometer team, led by principal investigator Dr. Rudolph Rieder, has been able to analyze the first-ever in-situ measurements of Mars rocks. "We are seeing much more differentiation of volcanic materials than we expected to see," said Dr. Matthew Golombek, Mars Pathfinder project scientist at JPL. "The high silica content of one of the rocks we've measured, nicknamed Barnacle Bill, suggests that there was more crustal activity—heating and recycling of materials—early in Mars' history than we thought." In addition, sweeping color panoramas of the Martian landscape, created by the imager for the Mars Pathfinder team are revealing clear evidence that the surface of Mars has been altered by winds and flowing water.



**A NASA Hubble Space Telescope image of the galaxy cluster CL1358+62 has uncovered a gravitationally-lensed image of a more distant galaxy located far beyond the cluster. The gravitationally lensed image appears as a crescent to the lower right of center. The galaxy's image is brightened, magnified and smeared into an arc-shape by the gravitational influence of the intervening galaxy cluster, which acts like a gigantic lens.**

## Telescopes team up to discover farthest galaxy seen in universe

An international team of astronomers has discovered the most distant galaxy found in the universe to date, by combining the unique sharpness of the images from NASA's Hubble Space Telescope with the light-collecting power of the W. M. Keck Telescopes—with an added boost from a gravitational lens in space. The results show the young galaxy is as far as 13 billion light years from Earth, based on an estimated age for the universe of approximately 14 billion years. This would place the galaxy far back in time during the "formative years" of galaxy birth and evolution, less than a billion years after the birth of the universe in the Big Bang. The detailed image shows that bright dense knots of massive stars power this object. Due to the firestorm of star birth within it, the galaxy is intrinsically one of the brightest young galaxies in the universe, blazing with the brilliance of more than ten times the Milky Way. "We are fascinated to be witnessing the very early stages of the construction of what could well become a massive galaxy like our own Milky Way," said Garth Illingworth of the

University of California in Santa Cruz. "This object is a pathfinder for deciphering what is happening in young galaxies, and offers a rare glimpse of the powerful events that transpired during the formation of galaxies." "We were excited by the possibility that we may have found a unique example of a galaxy in formation at the time of the earliest quasars," said Marijn Franx of the University of Groningen in the Netherlands. Predicted by Einstein's theory of general relativity, gravitational lenses are collections of matter (such as clusters of galaxies) that are so massive they warp space in their vicinity, allowing the light of even more-distant objects to curve around the central lens-mass and be seen from Earth as greatly magnified. The object is so far away, observing it in such detail would tax the capabilities of both Hubble and Keck without the magnification of the gravitational lens, provided by a foreground cluster of galaxies that is much closer to us at five billion light-years. Due to a rare and fortunate alignment of the young galaxy behind

the foreground cluster, astronomers gain a magnified view that is five to ten times better than Hubble alone can yield for an object at such a great distance. A telltale sign of the lensing is the smearing of the remote galaxy's image into an arc-shape by the gravitational influence of the intervening galaxy cluster. The smeared image of the galaxy stood out because of its unusual reddish color. "Such magnified galaxies had been observed before, but never with such a color. The special color of the galaxy in the arc is due to absorption by the matter in the universe between us and the galaxy, and suggested to us that it was at a great distance," Franx said. The suspected remoteness of the lensed object was confirmed when the team of astronomers made spectroscopic observations with one of the twin 10-meter Keck telescopes on Mauna Kea, Hawaii to measure its redshift, and therefore its distance, based on the shifting of its light towards the red end of the visible light spectrum. The resulting high redshift corresponds to a very early era when the universe was just beginning to form galaxies.